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ENHANCE MODEL AND DESIGNING CONTROL ACCU CHARGING AND CONSUMPTION USED IOT

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ABSTRACT

This model was designed to monitor 2 ACCU, namely ACCU1 and ACCU2. ACCU1 is light-weighted and paralleled with a DC motor load while ACCU2 is loaded with a DC motor and paralleled with a lamp load. If the accu1 and ACCU2 electrical power is in full condition then ACCU1 is burdened with a lamp only and ACCU2 is burdened with a DC motor only. Along with the development of battery / ACCU technology, there is also a development of charging systems and charging ACCU manually or automatically. In this paper, the results of research will be explained on the manufacture of tools that function to monitor and control charging and charging electrical power from accu which is burdened with DC lights and motors through a control panel or android smart phone with IoT technology.

Keywords : ESP32, ACCU Charging, ACCU Loading, IoT

INTRODUCTION

Information technology is currently developing very rapidly, one of which is the development in the field of the Internet of Things (IoT). IoT had once model development, itself has emerged as a major issue on the Internet. it is expected that billions of physical things or objects will be equipped with various types of sensors connected to the internet through the network as well as technology support such as embedded sensors, radio frequency identification (RFID), wireless sensor networks, real-time and web services, IoT actually physical cyber systems or networks of the network. With a large number of things/objects and sensors/actuators connected to the internet, massive and in some cases real-time data streams will be automatically generated by connected things and sensors. Of all the activities present in IoT is to collect the correct raw data in an efficient way, but more important is to analyze and process the raw data into more valuable information.

With the description above about IoT, a study was made that applies this technology to the manufacture of a monitoring device for the condition of the current, voltage and electric current on the accu wirelessly displayed on the smart phone screen through the power can be recharged. In this study the Battery Status Monitoring System at the time of charging and loading using ESP32 & IoT Cloud. By using this system, it can monitor the voltage and percentage of the battery from anywhere in the world. Therefore, this system is useful for remotely monitoring the charging/discharge status of the battery.

As we know, the battery in any system or device is the main component, since it powers the entire system. Therefore, it is necessary to monitor the voltage level of the battery. So that all know that improper charging and discharging systems can cause battery damage or system failure. Most electrical/electronic devices have a Battery Management System (BMS). Actually, BMS monitors all battery properties such as system voltage, current, > automatic breakers.

LITERATURE REVIEW.

2.1. Accu Charging and Power Consumption

Any electronic equipment always needs a power source to operate electronic components built into a system. One of the power sources as accu that is already charged and sufficient to run the components in the circuit. So the charging and use of accu must be monitored in a system to avoid running out of Accu power so that the plate turns off or does not work because the power source is not there

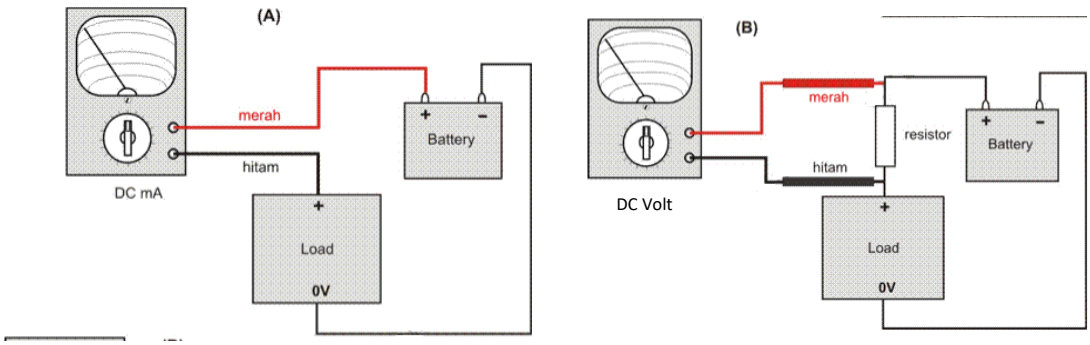

Figure 1. Accu Current and Voltage Measurement

2.2. ESP32 Microcontroller

The ESP32 Microcontroller module is a board used to develop Internet of Things applications. The module consists of the Tensilica Xtensa® Dual-Core 32-bit LX6 microprocessor. The processor is similar to the ESP8266 but has two CPU cores (individually controllable), operating at a clock frequency of 80 to 240 MHz which can be maximized in performance up to 600 DMIPS (Dhrystone Million Instructions Per Second). And it also consists of 448 KB ROM, 520 KB SRAM and 4MB Flash memory (for program and data storage) which is enough to cope with the large strings that make up web pages, JSON / XML data, and everything that will be uploaded on the current IoT device.

ESP32 Integrates the 802.11b/g/n HT40 Wi-Fi transceiver, so that it can not only connect to the WiFi network and interact with the Internet, but also can set up its own network, allowing other devices to directly connect esp32. In addition, the ESP32 also supports WiFi Direct, which is a great option for peer-to-peer connections without the need for an access point. WiFi Direct is easier to set up and its data transfer rate is much better

than Bluetooth. The chip also has dual-mode Bluetooth capability, which means it supports Bluetooth 4.0 (BLE/Bluetooth Smart) and Bluetooth Classic (BT), making it more versatile.

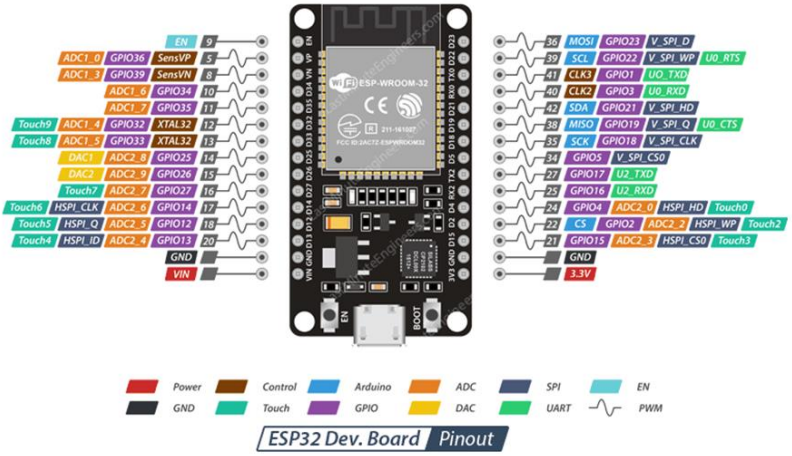

Figure 2. ESP32 Microcontroller Chip

2.3.Current and Voltage Sensor INA219

INA219 is a current sensor that is quite thorough and sensitive, oleh therefore this sensor is suitable for use in small DC current measurements. The sensor is able to read load currents up to milli amperes. In addition to current, this sensor is also capable of reading the voltage on the sensor input source pin. So it can be said that this sensor has the ability to read voltage and current at the same time. Specifications The INA219 type current sensor is able to measure voltages up to 26VDC and currents up to 3.2 A, when multiplied by current and voltage, the power can also be calculated at once.

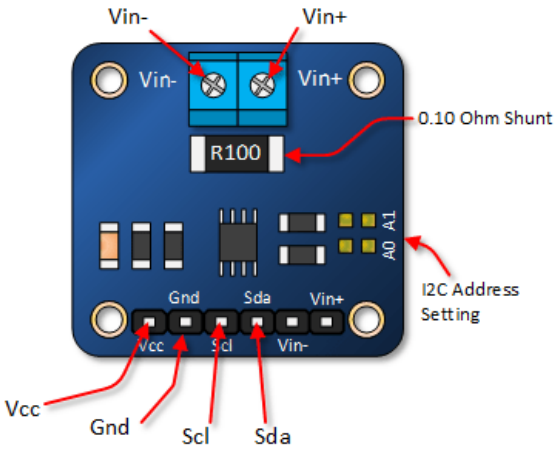

Figure 3. Ina219 Current Sensor

2.4. Konsep Internet of Things (IoT)

Internet of Things (IoT) is a computational concept that describes how a physical object that is often used daily can be connected to each other through the internet network

and can identify one with the other. How can the object communicate? IoT can have a significant impact because in the realm of IoT, these objects can represent themselves digitally to be connected to users, other objects, and even large data sets. When a set of objects works in one system, these objects are able to provide more benefits to users because they are richer in information.

Figure 4. Internet of Things (IoT)

METHOD

The method in this study is the manufacture of tools for monitoring current, voltage and power conditions Accu carried out in the laboratory. The stages of the study are depicted in the form of a diagram of fish bones which in figure 1.

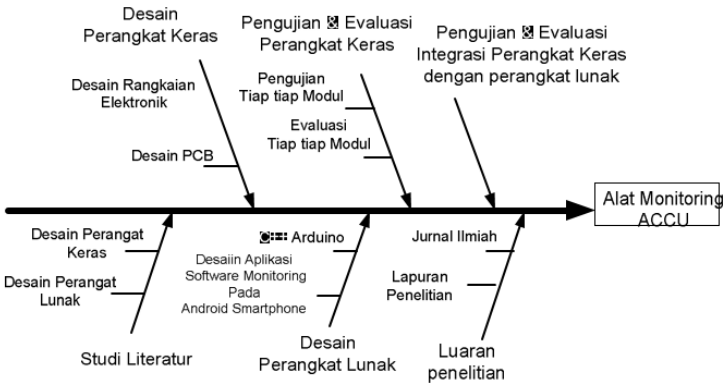

Figure 5. Diagram of the Stages of Research Implementation

1. Hardware Design

The hardware block diagram can be seen in figure 6. This tool is designed with functions for monitoring current conditions, tags and electrical power rather than accu displayed on the OLED viewer and on the smartphone screen. The tool uses the main components of the ESP32 microcontroller, where the components have been integrated with

the wifi module and other supporting modules, namely a series of current sensors, voltage sensors and OLED performers.

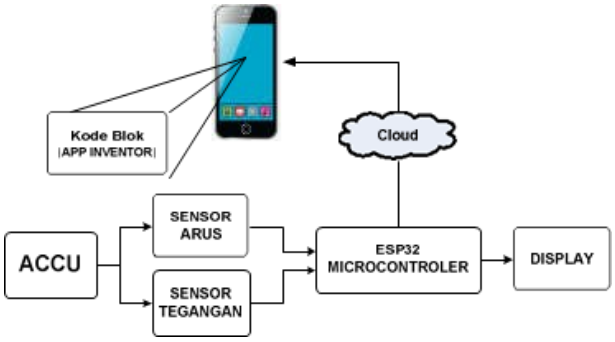

Figure 6. Accu Power Monitoring Block Diagram

The design of the software consists of 2 parts as follows:

- The software used for esp32 is C++which is designed using Arduino IDE.
- The software used in making mobile applications on smartphonesan uses android app inventor.

The following flowchart of the software design can be seen in figure 7.

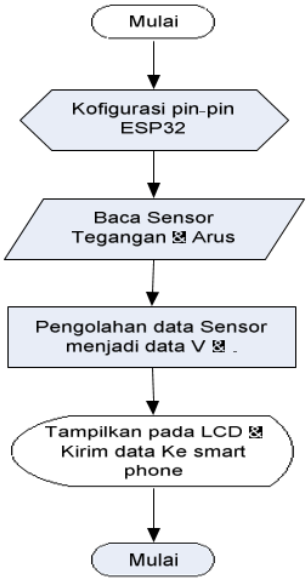

Figure 7. Flowchart Monitoring Accu Charging and Power Consumption

RESULTS

4.1.Research Results

The results of the study include the implementation of hardware consisting of several electronic circuits and the implementation of software in the form of coding C ++ Arduino as well as mobile applications based on Android programming. An overview of the

monitoring and control tools for charging and accu power consumption can be seen in figure 8 below.

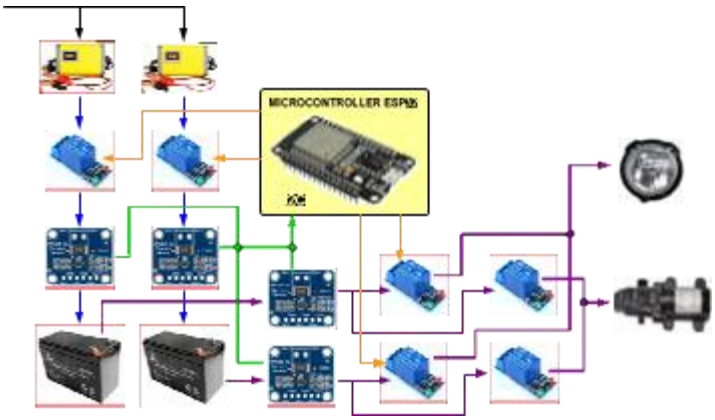

Figure 8. Charging and Power Usage monitoring tool Accu

4.2. Process Automatically Charging

The process of charging Accu automatically by monitoring the current and voltage can control high-voltage electronic devices using relays. The relay is actually a switch that yang is operated electrically by an electromagnet. Theagnet electrom is activated with a low voltage, if the output of pin 33 is in the "LOW" state then there is a current flowing from +5V passing through R4, D1,U1,D2. Because there is a current through the optocoupler (U1), Q1 gets a voltage bias of +5V because the C-E (VCE = 0V) of the optocoupler in the condition is saturated, resulting in the C-E Q1 being saturated as well. When the Q1 condition is saturated, there is current flowing through the relay coil so that the relay switch is in the ON condition (ACCU1 charging process). If the output of pin 33 is in the logical state "HIGH", the opposite condition will occur, that is, there is no ACCU1 charging process. The same process will also be carried out in the ACCU2 charging process. To multiply the process of charging ACCU 1 and ACCU2 is done with a program that has been uploaded on the ESP32 microcontroller chip.

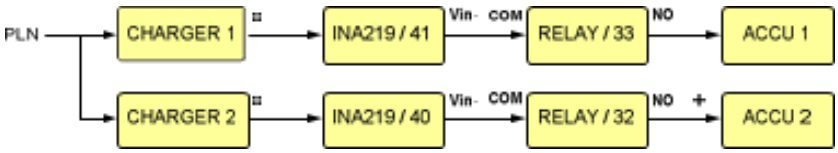

Figure 9. Accu Charging Process

During the charging process, the current capacity that has been stored in the ACCU is also monitored through the INA219 current sensor. Then the current data sensor measured by the INA219 sensor is sent to the arduino microcontroller. The rus data is used to make decisions on accu charging forwarded or disconnected through the relay.

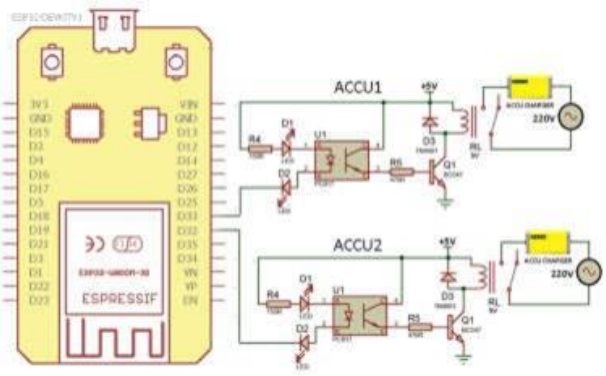

Figure 10. Schematic Accu Charging Process

The circuit of the current sensor used in the ACCU power monitoring system using theNA219 I chip is shown in figure 11. Circuit design of a current sensor that can measure the current, voltage, and power of a circuit. The INA219 sensor is a sensor that functions to measure 2 parameters at once, namely voltage (volts) and current (amperes), so that the power (watts) and also the shunt voltage can be calculated. This series of sensors has been sold a lot in the form of the INA219 Sensor Module produced by the Adafruit company. This Sensor Module is equipped with a resistance of 0.1 ohms, a shunt resistor of 1% to meet the current measurement requirements. The voltage that can be measured is up to 26v while for the current it is up to 3.2 A. For communication, this sensor uses I2C, namely SDA and SCL. The INA219 Current Sensor can be easily used by Arduino to measure current and voltage.

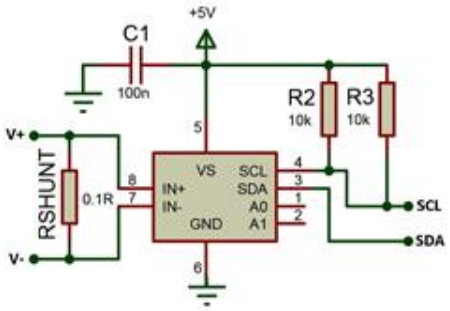

Figure 11. Ina219 Current Sensor

The accu monitoring process (monitoring) automatically by monitoring the current and stretchand power given to the load of the lamp and pump can be seen in the monitoring block diagram of the use of ACCU figure 12. If the power on ACCU1 is at the minimum condition limit, then relay/27 and relay parallel/14 are in the open condition (not connected to the load of the lamp and pump), then charging the ACCU1, ACCU2 provides power to the pump by activating (connected) relay/26 and the lamp by activating the relay parallel/26. Then vice versa, if on the contrary ACCU2 is at one minimum limit condition, then relay / 26 and relay parallel / 25 are in an open condition, then ACCU2 charging is carried out, ACCU1 provides power to the pump by activating relay / 27 to activate the lamp and relay parallel / 14 to activate the pump. The realization of the monitoring circuit can be seen in figure 13.

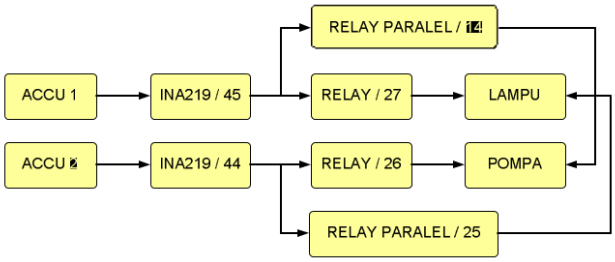

Figure 12. Monitoring Accu Power Usage

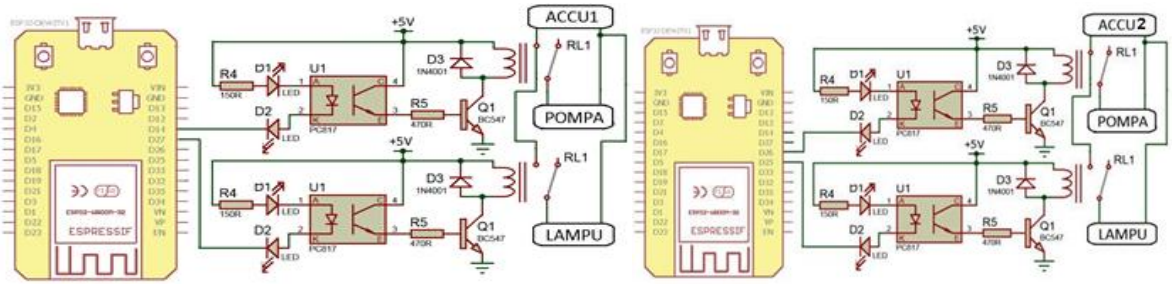

Figure 13. Monitoring Power Usage of Accu 1 and Accu 2

Design software to create applications on mobile phones using android MIT APP Inventor which consists of viewer design and block code. Viewer design is a user interface design that will appear on the mobile phone screen. The accu power monitaoring application viewer design can be seen in figure 14. While the design of the block code consists of several parts, namely:

Figure 14. Accu Power Monitoring Interface Design

The selling of ACCU control and monitoring tools can be carried out through the circuit panel directly or through an application installed on the mobile phone Photos of the tools can be seen in figure 15.

Figure 15. Accu Charging and Power Consumption Monitoring Process

The test results at the time of charging ACCU1 and ACCU2 conditions of voltage, current and power parameters displayed on the OLED screen can be seen in figure 16.

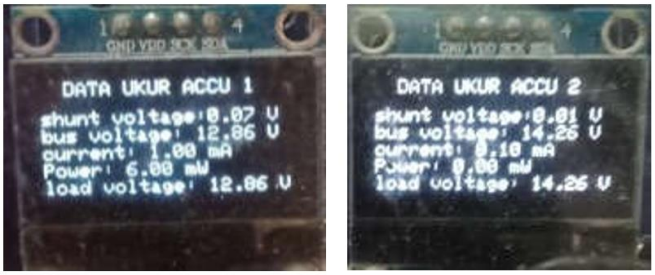

Figure 16. OLED Display on Accu 1 and Accu 2 Power Monitoring

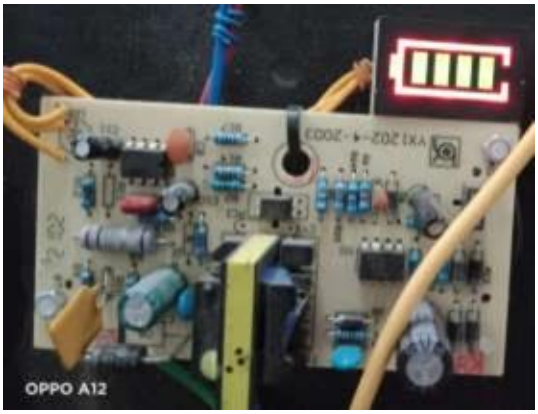

Figure 17. Accu Charger Circuit

CONCLUSION

From the design and testing of the Accu Charging and Power Consumption Monitoring system, it can be concluded as follows:

- In this study, the maximum current that can be measured is 3.5 A according to the sensor used, namely the INA219 type.
- The INA219 sensor is able to output measurement data in the form of Bus Bar Voltage (voltage at the charger source or at the Accu source), Voltage falling on the shunt voltage sensor), load voltage, charging current and accu usage (current), and accu power (Power).
- Control and monitoring can be done using an Android smartphone with Internet of Things technology connected to Google's server, Firebase.
- The Accu Power Control System uses an Android smartphone programmed using the MIT App Invntor 2 programming language.
- Control and monitoring can be done anywhere, to see the status of the accu through the internet network connected to Google (Firebase) servers.

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